

**CURRENT RESEARCH AND
DEVELOPMENT PROGRAMS**

Video recording

Magnetic thin-film techniques

Magnetic transducer development

Batch fabrication using
monolithic techniques

Modulation and detection
of digital signals

Content addressable memories

DATA DISC, INC.
1275 CALIFORNIA AVENUE
PALO ALTO, CALIFORNIA
(415) 326-7602



DATA DISC, INC. A UNIQUE CAPABILITY IN MEMORY SYSTEMS

Data Disc, Inc. was founded in 1960 to develop advanced techniques using magnetic discs for data storage. The result is a product line featuring:

Movable head and disc memory systems using single disc cartridges which are interchangeable between machines

Fixed disc head-per-track systems with 32 heads on each side of a single disc

Key to the low cost and high efficiency of the fixed and movable systems is utilization of *in-contact* recording principles. Proprietary precision-engineered magnetic heads operate in continuous contact with Data Disc nickel-cobalt plated discs having a rhodium flash (the surface finish is comparable to that of optical lenses). The transducers touch so lightly that head and disc service life are in excess of 20,000 hours, with negligible wear and degradation of data signals. *In-contact* recording results in exceptional resolution so that in the near future, it is anticipated that bit packing densities of greater than 10,000 bits per inch will be available from Data Disc.

Performance characteristics of Data Disc systems are superior to any comparable systems within their price categories, evidenced by the fact that this equipment has been or is being interfaced with most of the digital computers with high-volume backlog.

The systems have been or are being interfaced with computers manufactured by Burroughs, Monroe, Texas Instruments, and our licensees General Electric, Univac, Friden and Elliott Automation of England and others.



Exceptional reliability is experienced in use, verified by in-house experimentation and reliability testing conducted by licensees and customers.

With the very low head forces involved, wear is negligible. Life testing has been in process on heads and discs for over 20,000 hours, with test heads remaining on the same track. There is no evidence of wear, except that the tracks are burnished. Output signals taken from write operations made over 20,000 hours ago, with no re-write, have deteriorated less than 5%.

Among the competitive advantages provided through Data Disc engineering design are the following:

Ability to use much higher recording densities

Lower cost

Higher reliability

Negligible wear (guaranteed for 10,000 operating hours)

Synchronous or asynchronous input/output

Freedom from routine maintenance requirements

Data Disc units perform the random access functions of larger, more expensive systems, and replace slower, less efficient mediums such as paper tape, punched cards, and in many instances, magnetic tape. A typical Data Disc memory, for example, has a data capability equivalent to 18,000 IBM cards. Other systems now in development will have capacities significantly greater.

Data Disc in-contact recording principles provide a video capability which is being utilized by such companies as Ampex, Lockheed, Ball Bros., and others. High bit packing density capability allows storage of a TV frame on each track (up to 150,000 bits), with synchronous or asynchronous transfer at variable speeds. Twelve megacycle sine wave signals have been successfully recorded and played back. The disc system is ideal as a video buffer.

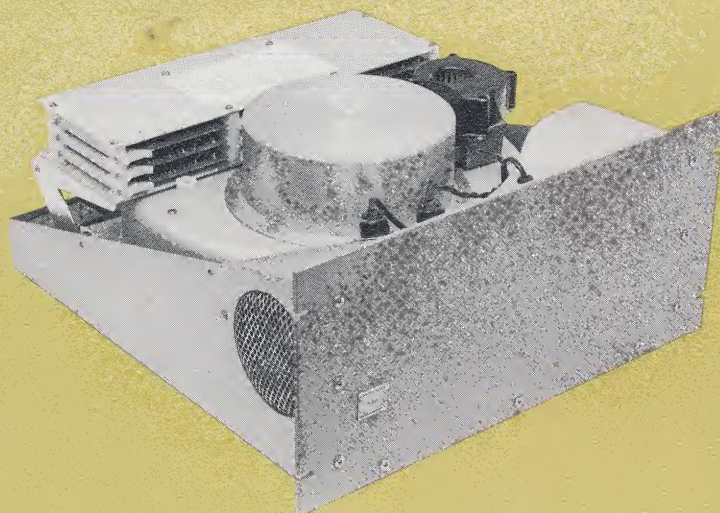
Magnetic in-contact recording on discs should prove to be significantly more economical and efficient than photographic or thermo-plastic recording, or other known techniques that are presently being researched.

Data Disc maintains a complete in-house capability for the design and manufacture of in-contact magnetic head assemblies, nickel-cobalt plated discs, and circuit, logic and total systems design.

Continuing development of advanced in-contact recording systems insures that the corporation will maintain a position of strong leadership in this field.



F-SERIES FIXED HEAD DISC MEMORY SYSTEMS



FEATURES

- Head-per-Track . . . up to 32 per surface, 64 total
- Low cost per on-line bit
- High single disc capacity . . . up to 6,400,000 bits
- Broad flexibility . . . straight-forward interface with any computer; synchronous or asynchronous I/O; any fixed or variable record length.
- High reliability . . . guaranteed one year
- No routine maintenance
- Compact and lightweight
- 3 million bits per second data rate
- 16.7 millisecond average access time

The F-Series Disc Memory Systems provide low-cost storage for a wide variety of applications. These general-purpose units can be easily interfaced with any digital computer and are offered with 100,000 bits per track in the following capacities:

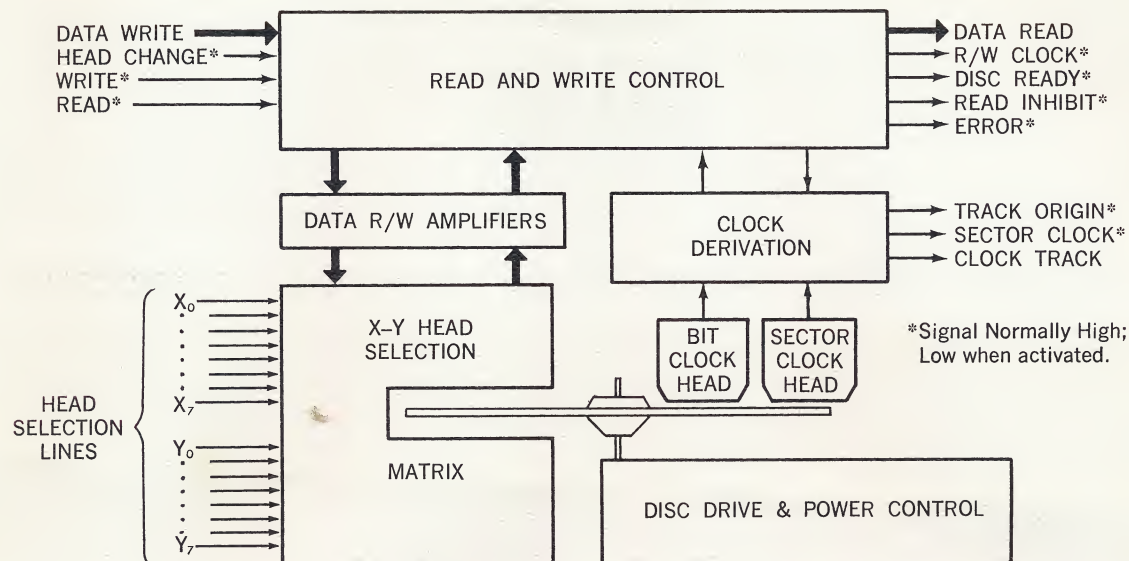
Model	Number of Tracks	Total Bit Capacity
F 1.5	16	1.6 million
F 3	32	3.2 million
F 6	64	6.4 million

A magnetic head on each track provides an average access time of 16.7 milliseconds. The standard data transfer rate of 3.0 million bits per second permits loading or unloading of the entire file in under 3 seconds.

The F-Series Units are complete memory systems which include head selection matrix, bit and sector clocking, read/write of serial data, and bit error checking during read. With no format restrictions, and a simple interface, the units are easily adaptable to business or scientific system requirements.

Because they require just 8¾" of rack space, a number of F-Series Systems may be used in a modular system to provide larger capacity.

Write for the F-Series Disc Memory Input/Output Manual and OEM price information. Investigate the economies made possible by the F-Series Systems for your installations. Technical assistance from Data Disc applications engineering representatives is readily available.



F-SERIES DISC MEMORY BLOCK DIAGRAM

SPECIFICATIONS

Disc Speed: 1800 RPM $\pm 1.3\%$, -3.0% .

Data Rate: 3.0 megabits per second $\pm 1.3\%$, -3.0% .

Data Capacity: 100,000 data bit cells per track.

F-1.5 1.6×10^6 Bits on 16 tracks.

F-3 3.2×10^6 Bits on 32 tracks.

F-6 6.4×10^6 Bits on 64 tracks.

Transient Data Error Rate: 1 in 10^{10} bits.

Track Format: Sector track available for customer programming.

No format restrictions.

D-C Power: +3.6V @ 0.8 Amps. $\pm 1\%$

+10V @ 0.4 Amps. $\pm 1\%$

-10V @ 0.8 Amps. $\pm 1\%$

+20V @ 0.2 Amps. $\pm 1\%$

100 mv ripple allowable on all D-C supplies. D-C ground connects circuit ground and the entire shock-mounted assembly within the case. D-C ground and A-C ground are isolated.

A-C Power: 120 volts $\pm 10\%$, 60 ± 0.5 , -1.5 Hz (cps), single-phase, 8 Amp starting current, 1.6 Amp running current. A-C ground connects to the front panel and rackmount tray.

A-C ground and D-C ground are isolated.

Size and Weight: $8\frac{3}{4} \times 19 \times 19\frac{3}{4}$ inches, 62 pounds.

ENVIRONMENTAL SPECIFICATIONS

Temperature:

Operating: 50°F to 105°F , less than 20°F change per hour.

Non-operating: -20°F to $+130^\circ\text{F}$.

Humidity:

Operating: 20% to 80% R.H. without condensation.

Non-operating: 0 to 90% R.H. without condensation.

Atmosphere: When operated with covers intact, an atmosphere filtered by a mechanical filter that is 20% efficient by N.B.S. discoloration tests shall be considered normal. Atmospheres present in steel and chemical plants are not considered normal.

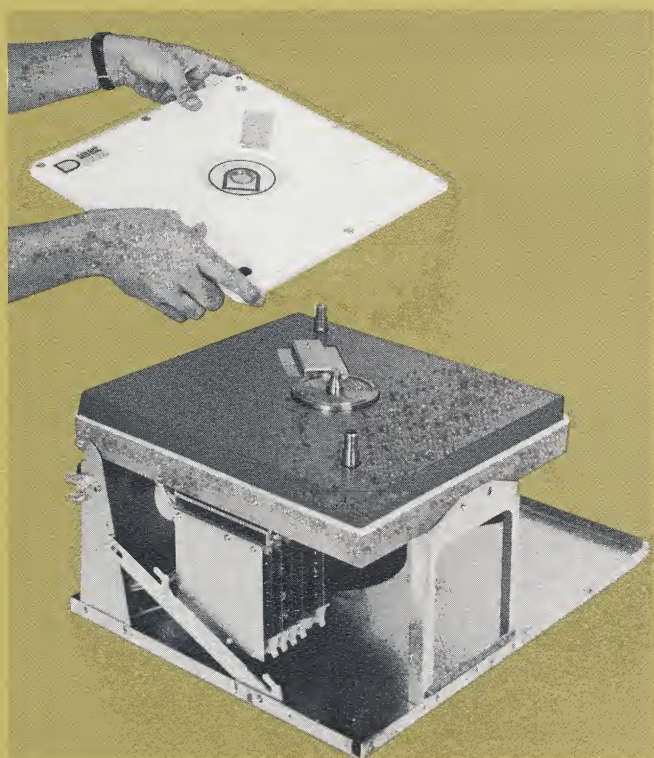
Vibration: Floor vibration of 0.15 G's maximum in the frequency range of 10 to 65 Hz (cps).

Shock: The disc package shall withstand a maximum shock of 5 G's in any direction without damage under operating and non-operating conditions.



M-6 INTERCHANGEABLE DISC MEMORY SYSTEM

The M-6 is a reliable, random-access memory system using interchangeable discs and a movable read/write head, operating at a density of 3000 bits per inch. Each



FEATURES

- Higher density through **in-contact** recording
- Stores 13 million bits per disc
- Interchangeable discs in protective cartridges
- Cartridge write-lockout safety feature
- Variable format under computer control
- High reliability — One year guarantee

12" diameter cartridge disc will store 13 million bits — 6.5 million bits per side, with 50,000 bits on each of 130 concentric tracks.

This high recording density has been achieved using proprietary **in-contact** recording techniques, along with integrated circuit electronics designed for reliable reading, writing, timing and control of digital data. Data is entered and retrieved serially-by-bit at a rate of 1 million bits per second.

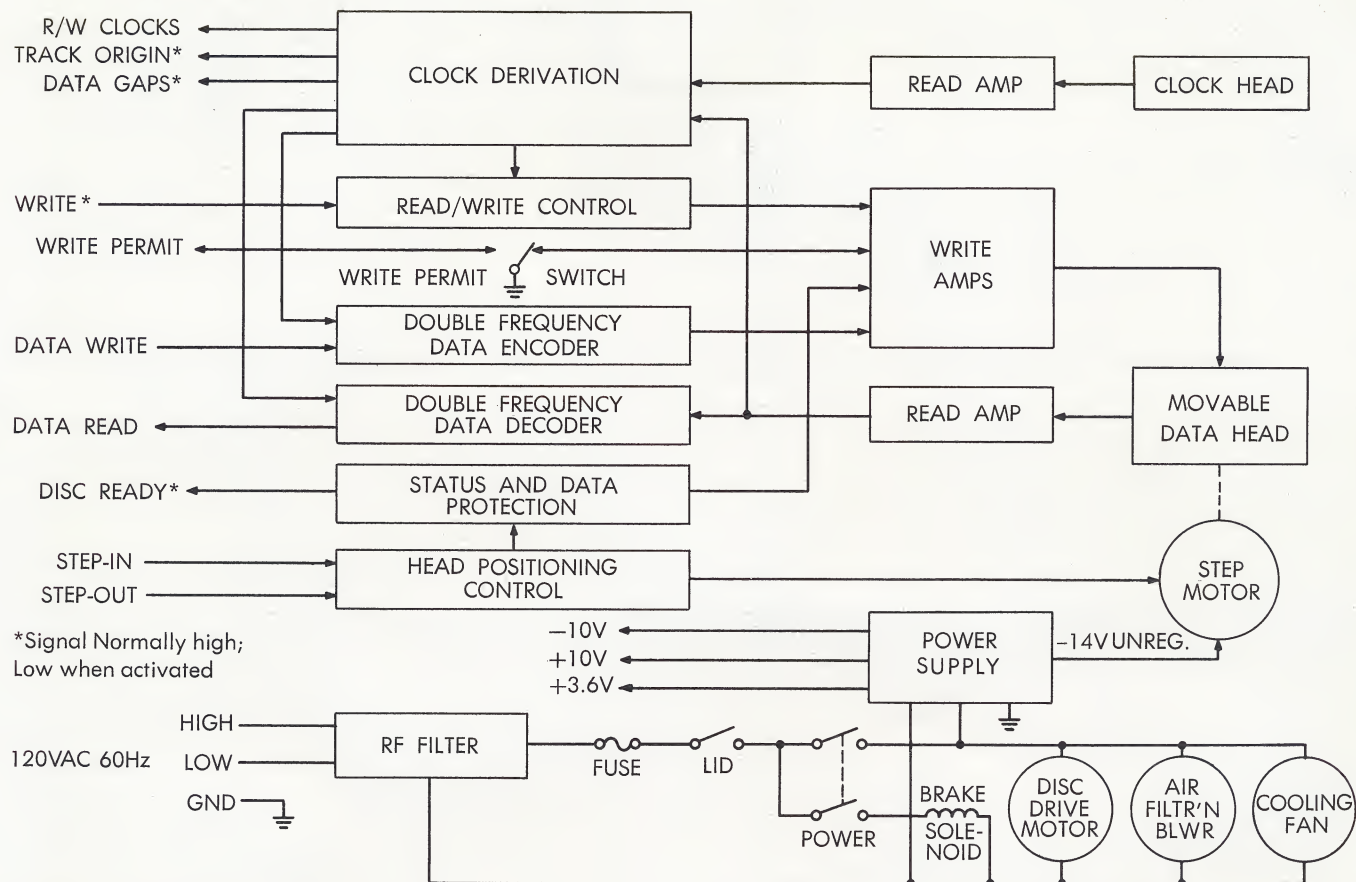
Each single disc, permanently encased in a protective cartridge, is interchangeable between M-6 systems. A cartridge disc is accessed by placing it, selected side down, on the spindle. As this is done, a shutter opens automatically so that the under-surface of the disc is **in-contact** with the movable head. Digital control signals move the head in 5-millisecond steps to any selected track in an average of $\frac{1}{3}$ second. Disc surfaces storing an unlimited library of separate programs can be accessed by changing cartridge discs, which takes about a minute.

Information can be arranged in records of any length — fixed or variable — under computer control, with no programming restrictions. The gaps between records are used for timing and location.

An interlock switch can be wired so that when a spool in each cartridge is removed, writing on the encased disc is then impossible. This safety feature prevents accidental erasure of valuable information.

The M-6 is easily interfaced to any computer, and has only ten interconnecting lines. The accompanying block diagram shows all the components.

Applications engineering and interfacing assistance is available.



M-6 SPECIFICATIONS

Capacity per disc: Approx. 13 million bits.

Capacity per surface: Approx. 6.5 million bits.

Number of tracks per surface: 130.

Capacity per track: 50,000 bits.

Rate of entry and retrieval: 1 million bits/sec (+1.3%, -3.0%).

Clock rate: 1 million pulses/sec (+1.3%, -3.0%).

Rotation rate: 1200 rpm (+1.3%, -3.0%).

Average latency time: 25 msec.

Adjacent track access time: 100 msec.

Average track access time: 333 msec.

Permissible temperature: Operating: 50°F to 105°F, no more than 20°F change per hour. Non-operating: -20°F to +130°F.

Permissible humidity: Operating: 20 to 80% R.H. without condensation.

Non-operating: 0 to 90% R.H. without condensation.

Permissible atmosphere: When operated in an approved enclosure, such as a Data Disc cabinet, an atmosphere filtered by a mechanical filter that is 20% efficient by N.B.S. discoloration tests shall be considered normal. Atmospheres present in steel and chemical plants are not considered normal.

Power requirements: 120 volts $\pm 10\%$, 58.5 to 60.5 cps, single phase.

Weight: 34 lbs.

Dimensions: 16" x 17.2" x 10", rack mountable.